

SUBSURFACE CONTAMINANTS PLUMES

EXPEDITED SITE CHARACTERIZATION

TTP #: FT0-8-C2-62

SITE CHARACTERIZATION TECHNOLOGY INTEGRATION AND SUPPORT

Principal Investigator: Paul Wang, Concurrent Technologies Corporation, 412-577-2648
Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

TASK 1: This project is to provide a center of expertise in alternative characterization and monitoring solutions to help reduce cost and schedule of groundwater and soil cleanup at U.S. Department of Energy (DOE) sites. The project scope involves providing technical and technology integration support to the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) as well as providing technical assistance to DOE sites. Task activities will be guided by the Site Technology Coordinating Group (STCG) needs documentation and site "Accelerating Cleanup: Paths to Closure" Plans, specifically in reference to site project baseline summary activities and critical closure paths/events. Specific activities will include: 1) serving as the CMST-CP technical point of contact (liaison) to the Subsurface Contaminants Focus Area (SCFA) and other programs listed above and providing these programs with expert review of proposals and projects; 2) assessing development status of technologies from all these programs; 3) linking the Principal Investigators (PI) with site users and vice versa; and 4) keeping the CMST-CP program and its customers informed about the availability, applicability, strengths, and limitations of technology development efforts.

TASK 2: This effort is aimed at facilitating timely responses to Headquarters (HQ) inquiries and forward relevant documentation from HQ to the DOE Field Lead. Activities include: 1) Coordinate collection and incorporate monthly performance reports from program facilitators into the monthly CMST-CP Business Review presentation; 2) help DOE/Nevada (NV) obtain guidance for documents and other required HQ actions and to help support the timely delivery of documents back to DOE HQ; 3) support HQ Program Manager in development of presentations, notes, or collection of other information related to CMST-CP.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Assist in Technology Gap Analysis and Documentation of Response to STCG Needs	04/30/00	03/31/00
2	Prepare Draft Innovative Technology Summary Report (ITSR) on Topic to be Determined	07/15/00	
<i>Updates:</i> Milestone is on schedule for completion by the deadline.			

Accomplishments and Technical Progress:

- Served on the 16-member Technical Assistance Team assigned to visit the Pantex Plant in April to investigate options for protecting the Ogallala Aquifer, contributed to the team document entitled "Recommendations for Protecting the Ogallala Aquifer at the Pantex Plant," and reviewed the pre-decisional draft document.
- Contributed to the development of a draft Program Execution Guidance (PEG) presentation by identifying the FY 2001 performance metrics for CMST-CP technologies in support of the SCFA, problem specifics, and planned accomplishments.
- Reviewed the Draft Handbook of *Groundwater Policies for Resource Conservation and Recovery Act (RCRA) Corrective Action* and provided editorial comments and an alternative design for the Overview section.
- Work continued in the updating and analyzing of a new technology demonstration of Particulate Matter (PM) Continuous Emissions Monitors (CEMs) at the Oak Ridge Toxic Substances Control Act Incineration (TSCAI) facility. A technical report which was prepared by the technology demonstration team was included into a major report prepared for the DOE HQ. The new information continues to be incorporated into the ITSR Technology Management System (TMS) #2973, titled *Particulate Matter Continuous Emission Monitors*.

Plans for the Next Quarter:

- Complete draft ITSR titled *Particulate Matter Continuous Emission Monitors*.
- Participate in CMST-CP Road Mapping exercise from a SCFA perspective, and provide SCFA characterization needs to the CMST-CP team.

FIELD ANALYSIS

TTP #: SR1-7-C2-21

DEVELOPMENT AND DEPLOYMENT OF INNOVATIVE DENSE NON-AQUEOUS PHASE LIQUIDS CHARACTERIZATION METHODS

Principal Investigator: Joe Rossabi, Westinghouse Savannah River Site, 803-725-5220

Project Objectives:

The purpose of this task is to enhance the applicability of the Ribbon NAPL Sampler (RNS), by FLUTE, to provide definitive detection of separate phase organics in the subsurface. The method, which is simple to use and broadly applicable, has been successfully deployed both above and below the water table and in open boreholes and through cone penetrometer rods. Successful deployments at Savannah River Site (SRS), Paducah GDP, and the McCormick-Baxter creosote site have established the utility of the RNS technology. To further enhance the utility of the technique, it is necessary to develop modes for addressing other common access methods. For example, other modalities that would enable greater applicability of the FLUTE method would include deployment in fractured rock systems (open boreholes) and deployment through the center of drill pipes.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Manufacture of #1 RNS	06/30/00	02/29/00
2	Complete Manufacture of #2 RNS	07/31/00	02/29/00
3	Complete Innovative Technology Summary Report (ITSR) for RNS	09/30/00	

Accomplishments and Technical Progress:

- The small diameter RNS has been successfully deployed through Geoprobe rods.
- Immediate demand for the small diameter RNS has enabled the manufacturer to sell the small diameter RNS to consultants in the United States and abroad.
- A handbook of the RNS for FLUTE which provides a description of the technology and deployment methods as well as data from actual sites has been written.
- The small diameter (1.25") RNS's for both open borehole and through the rod installation have been fabricated and shipped.
- The fractured rock RNS has been fabricated and shipped.
- The RNS is gaining rapid acceptance from environmental contractors.

Plans for the Next Quarter:

- The Principal Investigator (PI) will speak at the Groundwater 200 Conference in Denmark on Dense Non-Aqueous Phase Liquids (DNAPL) characterization methods and barometric pumping for DNAPL characterization.
- The PI will also select a site for deployment of the fractured rock RNS.

TTP #: FT0-9-C2-21**RAPID SAMPLING USING 3M TECHNOLOGY**

Principal Investigator: David Seely, 3M Corporation, 612-736-6057

Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

The objective of this project is to develop, optimize, test, and demonstrate innovative rapid field water sampling systems that are user-friendly and applicable to a wide range of contaminants.

This technology is based on 3M's EmporeTM membrane technology for solid phase extraction.

Phase I of the program developed the field sampling system and membrane disk holders.

Membrane materials were developed to selectively sample for lead and technetium. The system has been field-tested and demonstrated at various sites around U.S. Department of Energy (DOE). Phase II has extended the sampling technology to strontium, cesium, and radium. Phase III will add sampling technology for uranium, as well as direct-read (self-indicating) techniques such as self-scintillating and colorimetric disk materials and direct radiometric counting for radioactive contaminants such as cesium. Also, the membrane packaging design will also be optimized, in addition to integrating the sampler with real-time, state-of-the-art instrumentation and determining the arrangement of disk holders in a series when multiple contaminants are being sampled at once.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	N/A		

Accomplishments and Technical Progress:

- After three rounds of tough negotiations, 3M eventually consented to DOE/National Energy Technology Laboratory (NETL) terms and conditions to perform the within scope additional effort (Phase III) for continued development and demonstrations of the 3M specialized membrane technologies for liquid sampling and analysis of the radionuclides. These savings are approximately 34% of the original proposed cost and approximately 51% of the final negotiated price.

- Produced and initiated testing on prototype membranes for both Ra and Cs that incorporate both adsorbing and scintillating particles.
- Cs and Sr Rapid Liquid Sampler (RLS) disks were shipped to Savannah River Site (SRS), where they are being used to monitor the remediation cartridge demonstration at the R Basin. Syringes and other equipment were included to facilitate the use of the RLS units in the aqueous matrix of high tritium, strontium, and cesium activities.
- Presented RLS technology at the 11th Annual Applied Research, Development, & Deployment Cleanup Technology Colloquium, Scottsdale, Arizona.

Plans for the Next Quarter:

- Continue SRS demonstration.
- Initiate new Phase III work on new disk technologies.

CONTAMINANT DETERMINATION & MIGRATION

TTP #: AL2-7-C2-21

ENVIRONMENTAL MEASUREMENT WHILE DRILLING

Principal Investigator : Cecelia Williams, Sandia National Laboratories - Albuquerque,
505-845-5722

Project Objectives:

The objective of this project is to distinguish contaminated from non-contaminated areas in real time while drilling at hazardous waste sites. The Environmental Measurement While Drilling (EMWD) system represents an innovative blending of new and existing technologies in order to obtain real-time data during drilling.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Deployment of Integrated EMWD Tool at U.S. Department of Energy (DOE) Site	09/30/00	

Accomplishments and Technical Progress:

- Continue to work with Rocky Flats Environmental Technology Site (RFETS) to develop a deployment plan for characterizing two sites using EMWD.

Plans for the Next Quarter:

- Prepare for the planned RFETS deployment.
- Design, test, assemble, and calibrate the EMWD tool for the RFETS deployment.

TTP #: NV0-5-C2-21

ENVIRONMENTAL REMOTE SENSING FOR MONITORING PLANT HEALTH (EPCOT)

Principal Investigator: Gene Capelle, Special Technologies Laboratories, 805-681-2252

Project Objectives:

The long-term goal is to develop methodologies and hardware to detect subsurface contamination at U.S. Department of Energy (DOE) sites by means of remote monitoring of signatures (via reflectance and laser-induced fluorescence) from vegetation overgrowth. FY 2000 is currently planned as the last year of the project so that the primary work is concentrating on analyzing and writing up data that have been collected on controlled stressed populations of plants.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Draft Articles and Submit for Publication	06/30/00	
2	Orderly Shutdown of Operations at Epcot	09/30/00	
3	Presentation and Written Final Report	09/30/00	

Accomplishments and Technical Progress:

- Analyses are continuing on leaf samples from various research projects.
- Analyses have been initiated on Laser-Induced Fluorescence Imaging (LIFI) and Laser-Induced Fluorescence Spectroscopy (LIFS) data on the effects of zinc on plant stress in bahia grass.
- Information collected to date is being inserted into a standardized database for general use.
- Neural net analyses are continuing to check for the effects of fluorescence intensity.

Plans for the Next Quarter:

- Analyze data from the group data take at Epcot and correlate with data collected by other collaborators.
- Continue neural net analyses, build the fluorescence database for LIFI and LIFS data, and investigate adding other data to the database.
- Prepare a LIFI/LIFS manuscript on the zinc-bahia grass relation for submission to a journal.

HIGH-LEVEL WASTE TANKS LANDFILLS

POST-CLOSURE MONITORING

TTP #: *AL2-8-C2-21*

ALTERNATIVE LANDFILL COVER DEMONSTRATION

Principal Investigator: Stephen Dwyer, Sandia National Laboratories - Albuquerque,
505-844-0595

Project Objectives:

This work is a continuation into a long-term monitoring phase of a major demonstration that involves large-scale testing and evaluation of alternative landfill cover designs using standard Resource Conservation and Recovery Act (RCRA) covers as baselines for comparison. The traditional RCRA covers have been shown to be ineffective in arid regions and expensive to install. The alternative covers outperform the RCRA covers in arid and semi-arid regions, are less expensive to install, and yield construction products that meet the design intent.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Mid-Year Status Review	03/15/00	03/15/00
2	Report for Fourth Year of Test Findings	09/30/00	

Accomplishments and Technical Progress:

- Replaced the field computers with updated models.
- Presented data to the annual Solid Waste Association of North America meeting, April 13.
- Data have been collected through May 2000 from the test covers for all water balance variables.
- Fieldwork evaluating the vegetation characteristics of the different covers has been completed for FY 2000.

Plans for the Next Quarter:

- Continue monitoring of the covers currently in place and submit status reports as appropriate.

WASTE RETRIEVAL

TTP #: FT0-0-C2-11

CENTER OF EXPERTISE FOR TANK SLURRY MONITORING

Principal Investigator: Richard Musgrove, Florida International University, 305-348-6622
Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

This project will be a multi-year, collaborative effort with ongoing tasks at Hemispheric Center for Environmental Technology/Florida International University (HCET/FIU), Oak Ridge National Laboratory (ORNL), and Savannah River Site (SRS). This effort will meet the needs of SRS, ORNL, and Hanford to develop effective slurry monitors for retrieval of high-level radioactive tank waste. This project will support finding or developing tank waste slurry monitoring technologies that can be deployed in the near future. Initial scope for this project will focus on development of an in-tank dual Coriolis slurry monitoring system to meet critical SRS needs for deployment in FY 2001. Collaboration with Hanford contractors and the Office of River Protection will continue to identify opportunities for deployment of a dual Coriolis system at Hanford and for other slurry monitors needed.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Submit Experimental Test and Evaluation Plan	01/30/00	03/17/00
2	Complete Slurry Monitor Tests to Verify Applicability for Site Field Testing	06/30/00	
<i>Updates:</i> This milestone is behind approximately two months due to delay in awarding renewal of HCET/FIU Cooperative Agreement.			
3	Issue report on evaluation of the dual Coriolis monitor performance.	09/15/00	
<i>Updates:</i> This milestone is behind approximately two months due to delay in awarding renewal of HCET/FIU Cooperative Agreement.			

Accomplishments and Technical Progress:

- Design review by SRS has resulted in significant design changes. The monitor will have a restricted sample range of 12 feet (versus previous design of 25 feet).
- The horizontal test loop has been expanded to incorporate innovative viscometers both in-line and within the static reservoir. These instruments will provide additional slurry characteristic data of interest as indicated during the user meetings.
- A Slurry Monitoring Technologies meeting was held June 27, 2000, at Pacific Northwest National Laboratory (PNNL). Potential Hanford users and representatives of Tanks Focus Area (TFA) compared past, present, and future technology applications to Hanford needs.
- Program review meetings were held May 10, 2000, at HCET/FIU with attendance by TFA Technology Integration Manager, Tom Thomas; Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) Focus Area Liaison, Glenn Bastiaans; and HCET/FIU project and program managers along with the HCET/FIU directors. Status and path forward were discussed for FY 2001, and continuing budgets and schedules were delineated. A Program Execution Guidance (PEG) and resulting Technical Task Plan (TTP) for FY 2001 are being generated with detailed milestones and costing. FY 2001 is now slated to include construction of an in-tank monitor prototype, construction of a full-scale test facility, and a complete functional test program.
- Horizontal test loop is in instrument calibration with a flow loop established pumping a slurry surrogate. Testing and documentation will continue through September 29, 2000.
- A formulation for surrogate slurry has been created and received concurrence by team members. Primary components are water, sucrose, and kaolin clay. A high shear mixer for preparation and conditioning of the clay is installed and working. The hot slurry is confirmed to be 95% within the range of 1 to 10 micron particle size, 98% greater than 1 micron. The chosen surrogate components will allow blending of combinations that closely emulate mechanical properties of the in-tank slurry.
- Conference calls on the dual Coriolis project were held July 13, 2000; June 22, 2000; June 01, 2000; and April 12, 2000, with participants from ORNL, TFA, SRS, CMST-CP, and HCET/FIU discussing details of the design and the test plan, ongoing slurry monitoring activities, and path forward.

Plans for the Next Quarter:

- Slurry monitoring-related activities at additional sites will be pursued centering around the meeting at PNNL.
- Detailed design by HCET/FIU and review by SRS are continuing. Electrical and mechanical engineering and design of subassemblies is a current priority. Contributions toward creation of a prototype design report will include selection of components by specification and vendor, schematics, operational flowcharts, revised mechanical layout, and assembly drawings.
- Delivery of additional sensor components is anticipated. Assembly of the test loop is functionally complete and the additional components will be added as they become available.
- Cold testing to confirm and refine design concepts and details for the in-tank specific design

will continue.

- HCET/FIU will analyze data from deployment of a dual Coriolis slurry monitor on high-level radioactive waste installed in December 1999 at ORNL. Analysis of data from this much larger system deployed in a loop outside the tank will allow incorporation of changes into the much smaller and challenging dual Coriolis slurry monitoring system. Initial data collection at ORNL began in March 2000 and is now complete. A preliminary report is due next quarter.

TTP #: *ORI-7-C2-31*

COMPARATIVE TESTING OF PIPELINE SLURRY MONITORS

Principal Investigator: Tom Hylton, Oak Ridge National Laboratory, 423-576-2225

Project Objectives:

This project will be a collaborative effort with ongoing tasks at the Oak Ridge National Laboratory (ORNL), the Hemispheric Center for Environmental Technology at Florida International University (HCET/FIU), and the Savannah River Site (SRS). This effort will meet the needs of both ORNL and SRS to monitor the suspended solids concentrations of radioactive slurries via in-line instrumentation. In FY 1999, a test program was performed by ORNL which evaluated a Coriolis meter for in-line density analysis of a radioactive slurry. The results from the testing showed that the Coriolis meter worked well for the in-line measurement of the slurry density. A correlation exists for estimating the concentration of suspended solids based on the slurry density, the carrier fluid density (i.e., supernate), and the solid particle density. The concentration of suspended solids was calculated from the density results with the densities of the carrier fluid and solid particles assumed to be constant. The results showed that the concept was promising; however, the accuracy of the suspended solids concentration determination could be improved if the supernate density was also monitored simultaneously. ORNL will test this concept by installing a Coriolis meter to monitor the density of the supernate in a radioactive process that is currently using a Coriolis meter to monitor the density of the slurry. ORNL will also provide technical support to HCET/FIU which will be testing the dual Coriolis meter concept with non-radioactive slurries.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
A.1-1	Install Coriolis Meter in Radioactive Application	01/30/00	01/13/00
A.1-2	Submit Deployment Plan for Dual Coriolis Monitor	01/30/00	01/28/00
A.1-3	Submit Final Evaluation of Dual Coriolis Monitor	09/19/00	
<i>Updates:</i> This milestone is currently on schedule.			

Accomplishments and Technical Progress:

- A draft report was prepared and submitted to key Tanks Focus Area (TFA) and Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) personnel for technical review. A copy was also sent to HCET/FIU to assist them in their test program for a dual Coriolis meter monitoring system for the SRS.
- The data that was obtained from the dual Coriolis meter monitoring system were compared with the data obtained from laboratory grab sample analyses. A draft report was prepared and issued for review and comment by TFA and CMST-CP personnel. A copy of the draft report was also sent to HCET/FIU to assist them with their cold testing of a dual Coriolis meter system for the SRS.
- Participated in a conference call with representatives from CMST-CP, TFA, SRS, and HCET/FIU. The primary purpose of the call was to provide a status update on the performance of the dual Coriolis meter system with the Oak Ridge application and to discuss the status of the dual Coriolis meter system that HCET/FIU is planning on deploying at SRS. ORNL is providing technical support to HCET/FIU on the project.

Plans for the Next Quarter:

- Comments received from reviewers of the draft report will be incorporated into the report. The report will then undergo grammatical review.

WASTE SAMPLING/ANALYSIS

TTP #: NV0-8-C2-31

INTEGRATED RAMAN *pOH* SENSOR FOR IN-TANK MONITORING

Principal Investigator: Job Bello, EIC Laboratories, Inc., 781-769-9450

Project Objectives:

The objectives of this project are to design, assemble, and deploy an *in situ* monitor for corrosive species in U.S. Department of Energy's (DOE) large-scale waste tanks. The goal is to develop a combined chemistry and corrosion probe consisting of a fiber-optic Raman probe for sensing nitrate, nitrite, and hydroxide concentration and an Electrochemical Noise (EN) sensor for monitoring in-tank corrosion. In FY 2000, EIC will work with Savannah River Site (SRS) to finalize the design of the deployment platform for the combined Raman/EN sensor that meets SRS specifications. Based on approved platform design by SRS, EIC will then fabricate and deliver the deployment platform along with the probe and associated instrumentation. EIC will also provide technical assistance to SRS in the cold acceptance testing of the corrosion probe at SRS.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Engineering	01/07/00	06/00
<i>Updates:</i> Engineering drawings were completed and sent to SRS for final approval.			
2	Deliver Raman System and Deployment Platform to SRS	03/31/00	
<i>Updates:</i> Fabrication was delayed by design approval; delivery expected 11/00 after successful cold acceptance test.			
3	Final Contract Closeout Report	03/31/00	
<i>Updates:</i> Report will be written after cold acceptance test; expected 1/01.			

Accomplishments and Technical Progress:

- Completed deployment platform engineering design and drawings.
- Tested Raman probe sampling system and protocol in sludge solution.
- Tested Raman probe in hot cell on untreated waste samples from SRS tanks 43H, 46F, 26F, and 32H; concentrations of nitrate, nitrite, and hydroxide were comparable to baseline ion chromatography and titration techniques.

Plans for the Next Quarter:

- Begin fabrication of deployment platform.
- Assemble Raman probe.

TTP #: *RL3-0-C2-11****SALT CESIUM SEPARATION PROCESS MONITOR***

Principal Investigator: Joe Brothers, Pacific Northwest National Laboratory, 509-375-2396

Project Objectives:

The baseline technology for the assay of the decontaminated salt solution is sampling followed by assay at a remote analytical laboratory. To implement an on-line monitor for Cs-137, Sr-90, and total alpha radiation Two existing radiation measurement technology systems will be adapted to meet these needs. Both of these monitors will be non-intrusive to the process flow stream and detect gamma, X-ray, and neutron emissions from the waste stream which pass through the process pipe.

A germanium gamma energy detection system will quantify the Cs-137, Sr-90, and other gamma emitters identified. A neutron detection system, coupled with process knowledge, will quantify the Transuranic (TRU) present.

Pacific Northwest National Laboratory (PNNL) will:

- Collaborate with Savannah River Site (SRS) to create a concise plan to survey neutron background radiation in the process cell at SRS and implement the plan. SRS will provide engineering support for the test at SRS.
- Create a concise plan to demonstrate the feasibility of measuring Sr-90 in the presence of Cs-137 to the specifications required by SRS. After approval of the plan by SRS, Tanks Focus Area (TFA), and Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP), PNNL will conduct the feasibility demonstration using radiation standards already available to PNNL.
- Provide on-site and off-site technical assistance using appropriate PNNL staff to SRS for completion of the conceptual design as required by SRS.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
A.1-1	Complete Letter Report on Neutron Survey	09/30/00	
A.2-1	Complete Final Report on Sr-90 Determination of Feasibility Demo	09/30/00	
<p><i>Updates:</i> Neutron background measurement delayed by SRS staff; probable slip of A.1-1 to FY 2001. Draft journal article on Sr-90 determination is undergoing internal PNNL peer review.</p>			

Accomplishments and Technical Progress:

- Provided technical support to SRS neutron measurement staff.
- Completed Sr-90 feasibility study. Draft journal article undergoing internal PNNL peer review.
- Provided review comments on SRS system specifications.

Plans for the Next Quarter:

- Continue to provide technical support to SRS neutron measurement staff on neutron background measurement as well as conceptual design.
- Submit Sr-90 journal article for publication.

MIXED WASTE

WASTE PROCESS MONITORING & CONTROLS

TTP #: *CHI-7-C2-32*

REAL-TIME PLUTONIUM MONITORING (ALSO FOR AMERICIUM AND CURIUM)

Principal Investigator: John McClelland, Ames Laboratory, 515-294-7948

Project Objectives:

The project has developed and assisted in implementing an on-line, real-time monitor for measuring the concentrations of americium and curium in a molten glass stream produced by the vitrification of tank waste at the Savannah River Site (SRS). The presence of the monitor will reduce the number of hazardous and expensive samplings and off-line analyses that will have to be done during the vitrification.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Provide Curium and Americium Monitor for Deployment at SRS	01/23/00	10/15/99

Accomplishments and Technical Progress:

- Monitor delivered to SRS in October 1999.
- Supporting and explanatory materials delivered to SRS in March 2000.

Plans for the Next Quarter:

- Project is completed. Further assistance to SRS will be provided on an *ad hoc* basis.

OFFGAS & EFFLUENT MONITORING

TTP #: CHI-7-C2-33

DEVELOPMENT OF A MULTI-ELEMENT METAL CONTINUOUS EMISSIONS MONITOR FOR COMPLIANCE MONITORING

Principal Investigator: David Baldwin, Ames Laboratory, 515-294-2069

Project Objectives:

The goal of this project is to provide a system capable of monitoring elemental emissions from thermal waste treatment facilities. The purpose of this monitoring system is to provide documentation of regulatory compliance with regard to toxic metal or radioactive emissions. In order to achieve this goal, we have developed a compact, high-resolution spectrometer based on Acousto-Optic Tunable Filter (AOTF) and high-resolution echelle grating technologies. The spectrometer is combined with an air-plasma Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES) system developed by collaborators at Mississippi State University (MSU). The combined system is capable of compliance monitoring of heavy metal (e.g., Resource Conservation and Recovery Act [RCRA] metals) and actinide (e.g., alpha emitters) contaminants in stack emissions. In FY 2000, innovations include 1) adaptation of the echelle spectrometer system for use as a Hg vapor monitor with simultaneous background and interference monitoring, and 2) application of the existing AOTF-echelle spectrometer system to other emission-based Continuous Emission Monitoring (CEM) techniques.

In addition, the reduced-pressure ICP CEM that was developed and tested with Diagnostic Instrumentation and Analysis Laboratory (DIAL) in FY 1999 will be modified and improved based on results of these initial tests. These innovations will improve the speed and reliability for compliance with Environmental Protection Agency (EPA) Maximum Achievable Control Technology (MACT) CEM regulations at thermal waste treatment facilities. The spectrometer has an advanced user interface capable of easy adaptation to atomic or molecular emission spectrometric applications such as hot cell and nuclear fuel analysis and processing, field analyses in complex matrices, or passive remote sensing. Additional applications are being sought.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Bench Testing of Echelle Mercury Monitor	06/30/00	06/30/00
2	Issue Report on CEM Applications	09/30/00	
3	Complete Modifications and Testing of Reduced-Pressure ICP	09/30/00	

Accomplishments and Technical Progress:

- Designed, assembled, and completed laboratory testing of the mercury monitoring system.
- Started tests of the ability to measure oxidation of mercury in the presence of high levels of HCl at elevated temperatures (~900°C).
- Successfully tested correction for SO₂ spectral interference in laboratory tests.
- Modified reduced-pressure plasma system to minimize the effects of fluctuating sample stack pressure.
- Began testing the Compact High-Resolution Spectrometer (CHRS) for gas-stream Laser-Induced Fluorescence Spectroscopy (LIBS) applications in preparation for tests in conjunction with developers of this type of monitor.
- Analyzed noise sources for the CHRS spectrometer system; determined the most significant noise source was shot noise on the dark current in the Charged Coupled Device (CCD) array detector. This may be improved by lowering the temperature of the array. Ordered a new detector with two stages of thermoelectric cooling to provide detection limits a factor of two better than the current single-stage-cooled detector when used as the detection system for the air-ICPAES CEM.
- Performed ray tracing of the echelle spectrometer optics to investigate improvements in detection limits by replacing spherical optics with an off-axis parabolic optics.
- Obtained off-axis parabolic optics and performed experiments confirming improvements over spherical optics by comparing contrast ratios in measured solar “dark-line” spectra.
- Final report from the CEM test at DIAL was completed and released as Ames Laboratory Technical Report #IS-5138. Comparison of the results from the CEM and from the EPA Reference Method 29 samples collected during field tests at DIAL in September for the three elements monitored shows very good agreement between the methods.
- Final draft of the Innovative Technology Summary Report (ITSR) for this project is in review.
- Began test plan of the CHRS in the ICPAES multi-metals CEM and the mercury monitoring system; both tests would include validation by simultaneous sampling using EPA Reference Method 29; mercury testing would include background (SO₂) and chemical interference (HCl) tests.

Plans for the Next Quarter:

- Continue modifications for a fieldable mercury monitor.
- Complete spectrometer modifications.
- Develop test plans.
- Field test CHRS-based ICPAES multi-metal CEM at DIAL.
- Field test Hg CEM at DIAL.

DISPOSITION OF FACILITIES (D&D)

METALS AND PIPES

TTP #: *CHI-5-C2-51*

PORTABLE X-RAY, K-EDGE HEAVY METAL DETECTOR

Principal Investigator: Terry Jensen, Center for Non-Destructive Evaluation/Ames Laboratory,
515-294-6788

Project Objectives:

The purpose of this work is to support Deactivation & Decommissioning (D&D) activities through development of improved X-ray, K-edge nondestructive techniques for detecting and quantifying uranium, plutonium, mercury, and other heavy metals located inside sealed containers or processing equipment. A prototype K-edge instrument was operated in a Large Scale Demonstration and Deployment Project (LSDDP) at the Savannah River Site (SRS). Feedback from this demonstration will be used to upgrade the data acquisition and analysis software.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Data Acquisition and Analysis Software	05/30/00	05/30/00

Accomplishments and Technical Progress:

- The computer system for the K-edge data acquisition and analysis program was upgraded to allow the imaging system to run adequately under Windows 98.
- Tests of new device drivers for the motor control, image acquisition, and multi-channel analyzer cards were completed.
- Modifications to the graphical user interface were completed and documentation of the software package was started.
- Documentation of the K-edge software package was completed.

Plans for the Next Quarter:

- Final tests of the K-edge data acquisition system will be performed and the project will be completed.

FACILITY CHARACTERIZATION

TTP #: FT0-0-C2-51

TECHNOLOGY ASSESSMENTS AND TECHNOLOGY INTEGRATION

Principal Investigator: Dr. S.K. Dua, Florida International University, 305-348-1640
Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

A full-scale system for rapid, cost-effective, field radiological screening of large quantities of lead bricks and other shaped lead material is needed at Idaho National Engineering and Environmental Laboratory (INEEL) and is the focus of this project. An accelerated real-time volumetric radioassay of lead forms will be carried out to make a cost-effective determination of 1) How much lead has measurable radioactive contamination due to use by U.S. Department of Energy (DOE), and 2) How much lead may be free released for recycling into the scrap metal industry.

Florida International University (FIU) will evaluate current technologies for handling and characterizing lead contaminated materials (including suitability, performance, risks/uncertainties) and make recommendations for the design of a system to meet the end-user needs.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Draft Report on Results of Detector Selection and Testing, System Component Testing, and Cost Savings Analysis to Allow Determination for Building Full-Scale System for Deployment at DOE Sites	06/01/00	06/14/00
<i>Updates:</i> This milestone is behind approximately one to two months due to delay in awarding renewal of FIU Cooperative Agreement.			
2	Year-End Report Including Optimal Design of a Full-Scale System Able to Assay Large Quantities of Lead Brick Quickly and Effectively.	09/06/00	
<i>Updates:</i> This milestone is behind approximately one to two months due to delay in awarding renewal of FIU Cooperative Agreement.			

Accomplishments and Technical Progress:

- Traveled a second time to meet with program managers and others regarding the Lead Assay project. Discussion focused upon the cost analysis for two design options submitted to INEEL in June versus disposal of all the lead at Envirocare. The two designs were developed by FIU and INEEL pledged support for finalizing a quality cost analysis and lead assay design that could be used to recycle clean lead when the current atmosphere of no metal recycling subsidies and clean lead can be recycled among DOE sites.
- Gamma spectrometric systems received from Canberra were set up for checking efficiency and energy calibration. The Broad energy Germanium (BEGe) is equipped with *In Situ* Object Counting System (ISOCS) software that can determine counting efficiency for various object geometries.
- Based on discussions with various vendors of technologies for robots and conveyor systems a conceptual design of the lead assay system was prepared. The system comprises of a robot for lifting lead bricks and placing on a conveyor, a chute for guiding a brick to the detector system, a BEGe/NaI detector system for measurement of contamination. The lead bricks that meet free release contamination criteria fall into a container whereas those that are found to be contaminated are pushed by a pushing device into a separate container for contaminated materials.
- Discussions were held with various companies to obtain price quotes on disposal of radioactive lead. Price quotes on material handling system (robots) and conveyor system were also obtained. These data were used for comparative assessment of the cost for direct disposal of lead as a waste and cost of characterization of contamination, disposal of lead that does not meet free-release criteria and recycling (gain) of lead that meets the free-release criteria. Cost comparison was performed.
- Discussions were held with manufacturers/suppliers of material handling and conveyor systems for price quotes on these products. 3-D drawings of the entire system were prepared and sent to the vendors to enable them to assess the effort needed for supplying the system. The price quotes and throughputs will enable Hemispheric Center for Environmental Technologies at FIU (HCET/FIU) to perform comparative cost-benefit analysis of the proposed system with the existing method of lead assay.

Plans for the Next Quarter:

- Test the gamma spectrometric system, confirm ISOCS counting efficiency, and perform initial measurements on lead available at HCET/FIU.
- Design a system suitable for radioassay of lead. Use the results of the initial tests at HCET/FIU and field tests at Big Rock Point for the Large-Bore Pipe Radioassay System and data obtained from INEEL about lead in different forms. Tests at HCET/FIU and Big Rock Point show that the system is suitable for radioassay of large-bore pipes.
- Obtain the details of the past radioassay system used at INEEL and the test results.
- Support INEEL in getting necessary analyses and paperwork completed to recycle a small quantity of assayed lead currently at INEEL.

TTP #: FT0-0-C2-52

REAL-TIME BERYLLIUM MONITOR FOR SURFACE AND AIR SAMPLES

Principal Investigator: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

This project, with the investigator to be selected under a Request for Proposals (RFP) to be issued by the National Energy Technology Laboratory (NETL), aims to develop, certify, and demonstrate a prototype airborne and surface contamination real-time (or near real-time) Beryllium monitor.

Upon delivery and implementation of an instrumentation system, the Industrial Hygiene program at Rocky Flats would be able to provide the Deactivation and Decommissioning (D&D) program accurate, real-time measurements of the airborne beryllium concentrations for both area monitors and personnel monitoring, as well as beryllium contamination assessments of a wide variety of surfaces. The real-time results in these critical monitoring functions will result in reduced risk of exposure for the work force, and increased productivity for those D&D activities involving areas potentially contaminated with beryllium.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Fabricate Prototype Instrument for Surface/Airborne Beryllium.	09/30/00	
<i>Updates:</i> This milestone will not be completed until FY 2001, due to delays in the award of the contract.			

Accomplishments and Technical Progress:

- Proposals were received by NETL on June 29, 2000.

Plans for the Next Quarter:

- The proposal, selection, and award process will be completed during the next quarter. One contractor will be chosen to go forward with their design of the real-time monitor(s) for surface and airborne beryllium contamination.

TTP #: NV0-5-C2-53

LASER-INDUCED FLUORESCENCE FOR ENVIRONMENTAL MANAGEMENT

Principal Investigator: John DiBenedetto, Special Technologies Laboratory, 805-681-2240

Project Objectives:

The FY 2000 work scope consists of ensuring that the backpack portable Laser-Induced Fluorescence Imaging (LIFI) unit is ready for implementation to U.S. Department of Energy (DOE) Deactivation & Decommissioning (D&D) sites that have requirements for uranium survey characterization. Needs which may be effectively addressed by the LIFI unit include characterization of interior and exterior surfaces at sites that have been used for uranium processing or storage and of scrap components from such sites.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete LIFI Backpack Unit Documentation	06/30/00	

Accomplishments and Technical Progress:

- Image processing graphical user interface programs are being applied and optimized.
- The ENVI programs have automated the processing of LIFI imagery, significantly increasing the speed with which LIFI images can be processed and creating files for the database under development.
- The database software packages being jointly developed by the Special Technologies Laboratory (STL) and the U.S. Army Corps of Engineers (USACE) personnel are specifically designed for database imagery and spectral and image data, so that data products can be searched and cross referenced.
- A meeting was held in March at STL with representatives of the USACE.

Plans for the Next Quarter:

- Signal collection, processing, archiving, and data analysis techniques to enhance real-time delivery of customer desired contaminant analysis and mapping are being developed and optimized.

FIELD PROGRAM ACTIVITIES

TTP #: CH1-0-C2-31

CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY PROGRAM TECHNICAL SUPPORT

Principal Investigator: Williams Haas, Ames Laboratory, 515-294-4986

Project Objectives:

This project provides technical and programmatic support to the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). The Principal Investigator (PI) serves as CMST-CP project facilitator and undertakes other CMST-CP technical support tasks as assigned. The principal areas of emphasis are the Mixed Waste Focus Area (MWFA), MWFA support provided by the Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU), and the monitoring and control of emissions from mixed waste thermal treatment.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Date Due</i>	<i>Completion Date</i>
1	Prepare Draft Innovative Technology Summary Report (ITSR) on <i>Advanced Tensiometer Technology</i>	07/15/00	
<i>Updates:</i> I have collected the technical information and data required for the ITSR. Have received some cost data from Joel Hubbell. I am well into the ITSR drafting process, but it is behind schedule for completion by July 15.			

Accomplishments and Technical Progress:

- CMST-CP Support to the Office of Environmental Management (EM) Small Business Innovation Research (SBIR) Program: As requested by Ron Staubly, U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL), provided contact information for 23 persons qualified to review SBIR grant applications in the area of fiber optic sensors. April 5.
- CMST-CP Support to the MWFA:
 - Completing my participation in the February MWFA End-User Review Meeting of February 2000 and one of its review panels, reviewed the draft summary report for the Review Panel on Alternative Treatment Technologies and provided written comments to Roger Scott, Idaho National Engineering and Environmental Laboratory (INEEL), as requested. April 14.

- With Jim Johnesee, INEEL, co-chaired three MWFA breakout sessions as part of the DOE Environmental Management Science Program (EMSP) Workshop held in Atlanta, Georgia, April 25-27. With Johnesee, provided a breakout summary presentation as part of the EMSP Plenary Session III, Summaries of Breakout Sessions by Chairs.
- Reviewed a proposed scope of work for the MWFA-funded Sensor Research and Development Corporation project to develop a mercury Continuous Emission Monitor (CEM) and provided written comments to Steve Priebe, MWFA Product Line Manager, Bill Owca, MWFA Lead, and Stephan Weeks, CMST-CP Liaison to the MWFA. May 6.
- Continued communication with Stephan Weeks, Special Technologies Laboratory (STL), CMST-CP Liaison to the MWFA, on topics of interest to the MWFA, including: 1) FY 2001 and 2002 plans, 2) MWFA needs and gap assessment, 3) the Non-Destructive Assay (NDA) Conference, 4) DOE incineration operation plans, (5) Environmental Protection Agency (EPA) evaluation of mercury CEMs.
- Multi-metals CEM Manuscript: Received notice that this manuscript was accepted for publication in the July 2000 issue of *Spectroscopy*. May 3. Provided digital graphics illustrations for use in the article. May 5, 30.
- ITSR on *Compact High Resolution Spectrometer (CHRS)*: Revised the draft ITSR, *Compact High Resolution Spectrometer (CHRS)*, Office of Science and Technology (OST) #1564, reflecting the comments and suggestions received from Stephan Weeks, CMST-CP Liaison to the MWFA; Charles Davis, CMST-CP Field Coordinator; and John Jones, CMST-CP Field Technical Manager. Forwarded the revised ITSR to those listed above and other CMST-CP and MWFA personnel who have an interest in the CHRS. April 10. Provided final revisions for the draft ITSR on the *Compact High Resolution Spectrometer (CHRS)* OST #1564, prior to its submission for OST Headquarters (HQ) review, to Jerry Lorenz, CMST-CP Document Specialist. May 15.
- CMST-CP Highlights: Submitted written weekly highlight information concerning application of the Dual Coriolis monitor for suspended solids content of tank waste slurry at the Oak Ridge site to John Jones, CMST-CP Field Technical Lead. April 5.
- CMST-CP Support to the EM Technology Information Exchange (TIE) Program: Suggested that Tom Hylton, Oak Ridge National Laboratory (ORNL), consider submitting his work with the Lasentec particle size distribution monitor for presentation at the TIE Workshop. Such a submission would be responsive to the Accelerated Site Technology Deployment (ASTD) portion of the call and/or the Tanks portion of the call. Since the workshop emphasizes lessons learned, such a presentation could cover much of the work Hylton and his operating colleagues at Oak Ridge have been doing with slurry monitors. May 15.
- Slurry Monitor Deployments: As requested by Charles Davis, CMST-CP Field Coordinator, provided information regarding deployments of two tank waste slurry monitors, a dual Coriolis monitor and a Lasentec particle size distribution monitor, at ORNL. May 30.
- Draft ITSR on *Advanced Tensiometer*:
 - Continued communication with Advanced Tensiometer PIs Buck Sisson and Joel Hubbell, INEEL; seeking additional technical information, cost data, and illustrations for use in preparing the ITSR on this subject. Received copies of materials used to promote

- commercialization of the Advanced Tensiometer from Tom Harrison, INEEL Technology Transfer and Commercialization Senior Account Executive. April.
- Communicated with Brian Looney, Westinghouse Savannah River Corporation (WSRC), and Joel Hubbell regarding the commercial availability of a similar “advanced tensiometer” from a German company, UMS. May 3, 15.
 - Continued communication with Joel Hubbell, INEEL; seeking additional technical information, cost data, and illustrations for use in preparing the ITSR. Received draft material from Hubbell for use in the cost section of the ITSR. May 26.
 - Continued communication with Joel Hubbell, INEEL, concerning input and questions pertinent to preparation of the draft ITSR on the *Advanced Tensiometer*, OST #2122. Topics included illustrations, installation, maintenance, and cost information. June 2, 12, 19. Completed the first draft of ITSR Sections 1, 2, 3, 6 and Appendix A, References. June.
 - CMST-CP Support–Deactivation & Decommissioning Focus Area (DDFA): As requested by Adam Hutter, CMST-CP Liaison to the DDFA, provided information to him and to Stephan Weeks, CMST-CP Liaison to the MWFA, concerning the Thermo Technologies Corp. Fast Response Isotopic Air Monitor" (rapid CAM). Also secured and forwarded additional contact and technical information concerning the planned procurement of advanced CAMs at the Los Alamos TA-54 site. May 1, 15, 17.
 - CMST-CP Support: Per request from Charles Davis, CMST-CP Field Coordinator, provided information regarding a CMST-CP project, Remotely Piloted Vehicles and Miniaturized Sensors (OST #76).
 - CMST-CP Support–History: As requested by Charles Davis, CMST-CP Field Coordinator, and Jerry Lorenz, CMST-CP Document Specialist, reviewed and provided written comments on the introduction and background sections of the draft Technology Summary Booklet. Also, as requested, collected and forwarded historical narrative and budget information on the CMST-CP to them for possible use in compilation of a CMST-CP history. May 6, 12, 23, 24. June 27.
 - MWFA Support: Per request from Stephan Weeks, CMST-CP Liaison to the MWFA, reviewed and provided comments on a draft Program Execution Guidance (PEG) for a new MWFA/CMST-CP project, Effluent Monitoring for Alternative Treatment Technologies. June 23.
 - CMST Conference Calls: Participated in the CMST-CP team conference calls on April 5, 19; May 3, 17; and June 14, 28. Topics addressed included EMSP Workshop and EMSP projects, CMST-CP Liaison support to the Focus Areas during the EMSP Workshop, monthly and quarterly progress reporting requirements, CMST-CP gap analysis and road mapping, ITSR progress, highlights, and technology development progress.

Plans for the Next Quarter:

- After receiving guidance based on the OST HQ review, complete final revision of the draft ITSR for the *Compact High Resolution Spectrometer (CHRS)*, OST #1564, and resubmit it to HQ for publication.
- Complete the draft ITSR for the *Advanced Tensiometer*, OST #2122, and submit it to the CMST-CP Field Office.

TTP #: CHI-9-C2-11

TECHNICAL SUPPORT AND PROGRAM LIAISON TO TANKS FOCUS AREA

Principal Investigator: Glenn Bastiaans, Ames Laboratory, 515-294-3298

Project Objectives:

This task provides technical support and assistance in field coordination and program support for the Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP). It involves and contributes to identification of technology needs; assessment of technology requirements, capabilities, and limitations; promotion of technology integration; assessment of technology development opportunities; and program planning and implementation. Glenn Bastiaans works as a member of the combined U.S. Department of Energy (DOE) Headquarters (HQ) and Field CMST-CP management and implementation team, providing technical and other support, as directed, to the CMST-CP HQ Program Manager and the CMST-CP Field Manager.

A primary duty is to provide liaison to the Tanks Focus Area (TFA) for all collaborative technology development and technical oversight activities.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Complete Technical Responses	02/28/00	01/28/00
2	Complete Draft Program Execution Guidance (PEG)	08/15/00	06/16/00
3	Prepare Draft Innovative Technology Summary Report (ITSR) on Topic to be Determined	07/15/00	
<i>Updates:</i> First draft of ITSR on Raman probe is 80% complete.			

Accomplishments and Technical Progress:

- Technical Support to CMST-CP & TFA:
 - Slurry Monitors: Bastiaans and Tom Thomas, of TFA, held a meeting with potential users of slurry monitor technology at Hanford on June 27. Bastiaans spoke on previous comparative testing. Dave Roelant of Florida International University (FIU) spoke on the dual Coriolis monitor for weight percent solids monitoring, and two Office of Environmental Management Science Program (EMSP) researchers from the University of California-Davis spoke about Nuclear Magnetic Resonance (NMR) and ultrasonic methods to measure slurry velocity profiles and viscosity. It is expected that two or more needs will be submitted through the Hanford Site Technology Coordination Group (STCG) needs process as a result of this meeting.

- **Fluidic Sampling and At-tank Analysis:** Bastiaans took part in a one-day project review of the fluidic sampling and at-tank analysis project on June 28 at Hanford. The meeting was attended by Hanford tank operations personnel, Hanford engineering workers, contract vendors, and TFA representatives. Funding levels, schedules, and expectations were established and reviewed for the deployment of a mobile, variable depth fluidic sampler at Hanford. Starting in FY 2002 co-development of an at-tank analysis system is expected to begin.
- **Raman Corrosion Probe:** Conference calls to facilitate progress in the deployment of the Raman probe were held June 7, 14, 21, and 28. Bastiaans is coordinating the budgeting required to place final contracts for fabrication of a probe deployment system and for cold testing the entire probe system to obtain acceptance for delivery to Savannah River Site (SRS).
- **Cs Salt Separation Process Monitors:** Bastiaans and Tom Thomas, of TFA, held a meeting with Ron Brodzinski of Pacific Northwest National Laboratory (PNNL) to review progress on the final deliverables of the monitor conceptual design process. Revised work plans are nearly complete and timely issuance of reports is anticipated.
- **Non-Destructive Evaluation (NDE) for Tank Safety:** Bastiaans met with the TFA Technology Integration Manager for Safety, Mike Terry, and started planning for a survey and workshop to support NDE technology deployment at six DOE sites for FY 2001. This planning will continue for the remainder of FY 2000 and will involve use of the Center for Non-Destructive Evaluation (CNDE) at Iowa State University.
- **Liaison to Diagnostic Instrumentation and Analysis Laboratory (DIAL):** Bastiaans and Tom Thomas, of TFA, made a site visit to the DIAL at Mississippi State University (MSU) on June 14. The purpose of the visit was to review technology development capabilities of DIAL and to advise DIAL of appropriate needs and opportunities for technology deployments at DOE sites.
- **CMST-CP Program Support:** Bastiaans participated in the CMST-CP conference calls on June 5 and 28. In support of the upcoming Road Mapping meeting, Bastiaans prepared a gap analysis discussing short and long CMST-CP needs related to the TFA mission and how technology development is being planned to meet those needs. In route to Richland, Bastiaans also stopped by the DOE/Nevada (NV) office to brief staff and the Technical Program Officer (TPO) on recent developments.

Plans for the Next Quarter:

- Weekly conference calls will be held to facilitate deployment of the Raman tank corrosion probe at SRS. Periodic conference calls will be held among representatives from TFA, FIU, SRS, and Oak Ridge National Laboratory (ORNL) to facilitate slurry monitor development work.
- Bastiaans will join other CMST-CP liaisons and DOE/NV personnel at a meeting to develop the CMST-CP road map. The meeting will be held July 11 and 12, 2000, at DOE/NV.
- Bastiaans will attend a scientific conference on sensors the week of July 24 and will visit EIC, Inc. (Raman probe vendor) as part of the same trip.

- Bastiaans will spend three days with TFA and CNDE personnel to plan NDE work for FY 2001. This meeting is tentatively scheduled for August 1 to 3, 2000, at Richland, Washington.
- Bastiaans will pay a site visit to 3M as facilitator for the 3M Empore project in August 2000.
- Attendance at the cold acceptance test of the Raman/Electrochemical Noise (EN) probe is tentatively scheduled for September 2000.
- Site visits to SRS, Oak Ridge Reservation (ORR), and FIU are tentatively planned for September 2000.
- Bastiaans will continue to supply CMST-CP management with updated project status, milestone, and spending information for the monthly business review, weekly program highlights, and other programmatic information.
- Bastiaans will assist in the preparation of the CMST-CP road map.
- Bastiaans will deliver a first draft of an ITSR on the *Raman Corrosion Probe*.

TTP #: CH2-7-C2-61

***CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY PROGRAM
TECHNICAL SUPPORT***

Principal Investigator: Bruce Friedrich, University of Iowa, 319-626-7947

Project Objectives:

Provide technical support and assistance in field coordination for the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). Serve as project facilitator for CMST-CP projects assigned by the CMST-CP field program manager. Monitor the technical progress and schedule status, perform an annual on-site review of technical progress, and transmit review reports to the Principal Investigator (PI) and CMST-CP Field Program Manager. Write Innovative Technology Summary Reports (ITSR) for projects assigned by the Field Program Manager.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Prepare Draft ITSR on Topic to be Determined	07/15/00	

Accomplishments and Technical Progress:

- Completed the first draft of an ITSR entitled *Real-Time Monitor for Transuranics in Glass* (Technology Management System [TMS] #2004). After the draft was reviewed by the CMST-CP field office, a revised manuscript was submitted to the field office.

Plans for the Next Quarter:

- Complete the final draft of the ITSR described above.

TTP #: FT0-0-C2-61

TECHNICAL AND PROGRAMMATIC SUPPORT TO THE CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY-CROSSCUTTING PROGRAM

Principal Investigator: David Roelant, Florida International University, 305-348-6625

Point-of-Contact: Ron Staubly, National Energy Technology Laboratory, 304-285-4991

Project Objectives:

This project provides program support and expert technical assistance in technical integration and field coordination for the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). The activities involve and contribute to identification and assessment of CMST-CP capabilities, limitations, needs, and technology performance requirements; promotion of technology integration, implementation, and commercialization; assessment of technology development opportunities; and program planning and execution. Some specific activities include collecting and inputting data on CMST-CP projects into the Technology Management System (TMS) database and the CMST-CP database, regular updating of technology deployment information, and technical and programmatic support to CMST-CP management. Additionally, Hemispheric Center for Environmental Technologies/Florida International University (HCET/FIU) will support CMST-CP liaisons with analysis of Site Technology Coordination Group (STCG) needs to help identify performance requirements, whether technology exists for the needs, to capture real technology gaps, and document in a gap analysis report.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Submit Needs Gap Analysis Reports	05/15/00	05/08/00

Accomplishments and Technical Progress:

- All tasks for this project have been completed, and funding has been spent. This will be the last quarterly report for this project.
- Collected all STCG needs related to CMST-CP and the Focus Area responses to these needs and put into a single document and delivered to U.S. Department of Energy (DOE). Also delivered a draft Technology Gap Analysis of CMST-CP for Deactivation and Decommissioning Focus Area (DDFA) to CMST-CP.
- Traveled to DOE-Mound site and participated in several conference calls to identify an implementation plan for improved characterization of contaminants under floors and buildings.
- Provided DOE-Ohio characterization technology information including vendors, system capabilities, operation costs, capital costs, and more for several applicable technologies from Office of Science and Technology (OST) and industry.

Plans for the Next Quarter:

- None.

TTP #: NV0-6-C2-61**CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY MANAGEMENT
AND TECHNICAL SUPPORT FOR MIXED WASTE FOCUS AREA**

Principal Investigator: Stephan Weeks, Special Technologies Laboratory, 805-681-2262

Project Objectives:

This project provides technical and administrative support for Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) projects associated with the Mixed Waste Focus Area (MWFA). The Principal Investigator (PI) will provide technical expertise, leadership, and assessments to facilitate various projects under CMST-CP; respond to CMST-CP information requests; conduct technical studies; assist in reports, cost savings, and other designated CMST-CP activities, as directed; develop and administer the public and team World Wide Web (WWW) sites; and champion technologies where applicable. Activities include support the identification of technology needs; assessment of technology requirements, capabilities, and limitations; prioritization of technology development activities according to the impact of cost savings for U.S. Department of Energy (DOE) sites; issuance of solicitations that seek solutions in the identified high-priority technology deficiency areas; technical monitoring of the progress of projects; program planning and implementation; and promotion of technology deployments to meet DOE site cleanup objectives. Major task activities also include helping to coordinate the CMST-CP input to the MWFA Annual Review.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Facilitator Reports on Assigned Projects	03/31/00	
<i>Updates:</i> Delayed in order to coincide with scheduled project demonstrations in September/October.			
2	Prepare Draft Innovative Technology Summary Report (ITSR)	07/15/00	
<i>Updates:</i> Delayed in order to coincide with performance testing scheduled for August/September.			

Accomplishments and Technical Progress:

- CMST-CP Technical and Programmatic Support:
 - Participate in bi-weekly CMST-CP Team Calls; respond as requested to business reviews, milestone, cost/schedule variances, deployments, weekly highlights, budget information, Technical Task Plans (TTP), ITSR status and other technical and programmatic information.
- Technical support to MWFA Effluent Monitoring (MWFA contact: S. Priebe):
 - Attended the IT3 Conference - International Conference on Incineration and Thermal Treatment Technologies May 8-12, 2000.
- Technical support to MWFA Waste Characterization (MWFA contact: W. St. Michael):
 - Attended the 7th Non-Destructive Assay (NDA) Waste Characterization Conference, May 23-25, 2000.

FACILITATED PROJECTS:

- Integrated Raman/Electronic Noise (EN) probes for in-tank Corrosion Monitoring (Technology Management System [TMS] Tech ID# 2015):
 - Fabrication of the deployment device to begin in July 2000.
 - Engineering drawing completed in June 2000.
 - Cold acceptance test of deployment and probe system scheduled in October 2000.
 - Weekly Combined Chemistry and Corrosion Probe conference calls with team tasked with the deployment at Savannah River Site (SRS).
 - PI supported David Hobbs, Savannah River Technology Center (SRTC) for completion of hot cell test analyzing actual waste using the Raman spectroscopy probe; data analysis of nitrate, nitrite, and hydroxide concentration measurement taken directly in a hot cell with the Raman fiber-optic probe system on untreated waste samples from SRS tanks 43H, 46H, 26F, and 32H compared favorably with the ion chromatography and titration baseline methods.
- Development of a Multi-element Metal Continuous Emissions Monitor (CEM) for Compliance Monitoring-Compact High Resolution Spectrometer (CHRS) project (TMS Tech ID #1564):
 - Field test Hg CEM in September 2000 at Diagnostic Instrumentation and Analysis Laboratory (DIAL).
 - Update and field test multi-metal Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES) CEM at DIAL in September 2000.
 - Coordination with Environmental Protection Agency (EPA) ETV Hg CEM performance testing.
 - Facilitating other CHRS applications and commercialization.
 - Draft *Compact High Resolution Spectrometer* ITSR was completed (Haas).
 - Final report from the September 12-17 CEM test at the DIAL Combustion Test Facility was completed and released as Ames Laboratory Technical Report #IS-5138. A reduced-pressure sampling/ICP system was successfully integrated with an air ICPAES which included the AMES-developed compact, high-resolution Acoustic-Optic Tunable Filter (AOTF)/echelle spectrometer. Continuous sampling of the stack effluent gas stream

into a reduced-pressure air ICP atom source allowed high-resolution atomic emission detection of EPA-regulated Maximum Achievable Control Technology (MACT) rule Resource Conservation Recovery Act (RCRA) metals (e.g., Cr, Pb). These measurements compared favorably with the baseline EPA Reference Method 29 sample analysis.

- A paper presented by the PI at the Environmental Monitoring and Remediation Technologies Symposium at the October 1999 SPIE meeting in Boston was received and reviewed. The paper described the development and test results for the multi-metal CEM.
- BetaScint™ Fiber-Optic Sensor for Detecting Strontium-90 and Uranium-238 in Soil (TMS Tech ID #70):
 - BetaScint technology selected for use in the BGRR Accelerated Site Technology Deployment (ASTD).
- Monitoring System for Fluid Level and Density in High-level Waste Tanks-Percent Suspended Solids probe project (TMS Tech ID# 279):
 - A final report is expected and will be distributed to Tanks Focus Area (TFA), SRS personnel, and other potential technology users.
- ITSr:
 - *Laser-Induced Breakdown Spectroscopy (LIBS) CEM* ITSr (TMS Tech ID #18) - The PI is working with the former LIBS CEM project PIs and Sandia National Laboratory (SNL) on the draft. A report on the demonstration at ICI Explosives Environmental incinerator in Joplin, Missouri, was received. The PI has received the baseline Reference Method 29 test results from the April demonstration in October and is comparing the results to the LIBS test results.
 - Hg CEM ITSr - The PI is working with CMST-CP, MWFA, EPA, DIAL, AMES and Sky+ on developing an ITSr for a technology that will be ready for implementation at a DOE thermal waste treatment site.
- CMST-CP Internet pages:
 - The new CMST-CP Field Office web site is being updated and is available on the CMST-CP Team site for review and comment.
 - Tiffany Zachry wrote CMST-CP public web site design plan and goals; goals include enhancing access to CMST-CP technology descriptions and information.
 - CMST-CP field project web-based database was completed and made available on the password protected team web site (November 1999). Business Review report in Microsoft ACCESS for the web-based CMST-CP Project database was updated (December 1999).

Plans for the Next Quarter:

- Continue to provide technical and programmatic support for CMST-CP and MWFA; particularly for field tests of CHRS in Hg and multi-metal CEMs at DIAL and Raman probe for cold acceptance test.
- Continue liaison tasks with MWFA with emphasis on effluent monitoring, RCRA NDA, and Remote Handled (RH) NDA.
- Continue interactions with DIAL PIs with emphasis on Particulate Matter (PM) and mercury

monitoring.

- Complete draft of new CMST-CP Field Office public web site for review.
- Participate in the CMST-CP Strategic Technical Road Mapping meeting July 10-11.
- Attend the Dioxin 2000 Symposium (20th International Symposium on Halogenated Environmental Organic Pollutants and Persistent Organic Pollutants (POPs) August 14-17.
- Complete facilitator reports on assigned projects.
- Complete draft of ITSR.
- Support web page functions as directed by CMST-CP Field Office personnel.

TTP #: NV0-9-C2-41

TECHNICAL AND PROGRAM SUPPORT FOR NUCLEAR MATERIALS FOCUS AREA

Principal Investigator: Paul Hurley, Special Technologies Laboratory, 805-681-2472

Project Objectives:

This task provides technical and program support for future Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) related projects in the Nuclear Materials Focus Area (NMFA). The principle role for this task is to serve as the liaison from CMST-CP to NMFA and provide technical and program support to the NMFA and CMST-CP field and Headquarters (HQ) program managers. Other tasks for this project include facilitation for several other CMST-CP related projects.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	CMST-CP Kick-Off Meeting Presentation	10/31/99	10/05/99
2	NMFA Technology Assessment Report	09/30/00	

Accomplishments and Technical Progress:

- Met with Kenny Osborne, NMFA Idaho Operations Office Program Manager.
- Attended the NMFA Kick-Off meeting in March 2000.
- Prepared a gap analysis for NMFA.
- Met with Gary Robertson, NMFA Albuquerque Operations Office Program Manager.

Plans for the Next Quarter:

- Examine proposals received by NMFA to determine which CMST-CP supported technologies can be used to reduce costs.

- Visit sites which have generated proposals to meet directly with the listed Points-of-Contact (POC).

TTP #: NV0-9-C2-61

CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY-CROSSCUTTING PROGRAM TECHNICAL & PROGRAM SUPPORT FIELD COORDINATION

Principal Investigator: Charles B. Davis, Professional Analysis Inc./Bechtel Nevada, 702-295-0541

Project Objectives:

The primary objective of this project is to provide overall coordination of the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP). As part of this coordination, responses to requests from Headquarters (HQ) for information, plans, tables, and other documents will be drafted using information obtained from the CMST-CP Team. Management and planning documents will be created as appropriate to assure good program management and document program performance.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Deliver CMST-CP Annual Performance Plan.	09/30/00	
<i>Updates:</i> This milestone may be revised or deleted as the role of the crosscutting programs evolves within Office of Science and Technology (OST).			
2	Deliver CMST-CP Multi-Year Program Plan Contributions to Focus Areas	08/15/00	
<i>Updates:</i> This milestone may be revised or deleted as the role of the crosscutting programs evolves within OST.			
3	Prepare Draft Innovative Technology Summary Report (ITSR)	07/15/00	
<i>Updates:</i> Anticipated completion 08/15/00; topic is <i>Laser-Induced Fluorescence (LIF) for Cone Penetrometer Test (CPT)</i> (OST #2237).			
4	Prepare CMST-CP Technology Summary-FY 2000	08/31/00	
<i>Updates:</i> Anticipated completion 08/31/00.			

Accomplishments and Technical Progress:

- Reviewed, edited, and/or submitted to HQ for publication ITSR: *Spectral Gamma Probe* (OST #2364), *Subsurface Barrier Validation with the SEATRACETM Verification & Monitoring System* (OST #308), *Real-Time Plutonium Monitoring: Process Monitor for Americium and Curium* (OST #2004), *Compact High Resolution Spectrometer (CHRS)* (OST #1564), and *Adaptive Sampling and Analysis Programs (ASAPs)* (OST #2946).
- Provided reviews of other documents: OST “Office of Long-Term Stewardship Study,” “Assessing the Probability of Inadvertent Human Intrusion at Nevada Test Site Radioactive Waste Management Sites,” sections of “Environmental Quality Gap Analysis,” and the draft Environmental Protection Agency (EPA) *Handbook of Groundwater Policies for Resource Conservation Recovery Act (RCRA) Corrective Action*.
- Compiled history of Integrated Project (IP)-CMST, CMST-IP, and CMST-CP organization evolution and technology development activities for inclusion in *Characterization, Monitoring, and Sensor Technology-Crosscutting Program Technology Summary: Fiscal Year 2000*.
- Provided ongoing maintenance of information on CMST-CP technologies in the Technology Management System (TMS) database.
- Provided management support to U.S. Department of Energy/Nevada (DOE/NV) personnel regarding budget, management, planning, and quarterly business reporting matters.

Plans for the Next Quarter:

- Continue to provide program coordination with regard to budget, management, planning, and business reporting matters.
- Participate in CMST-CP Road Mapping activities.
- Review, edit, and/or submit several CMST-CP ITSRs to HQ for publication.
- Complete ITSR: *LIF for CPT* (OST #2237).
- Complete and distribute *Characterization, Monitoring, and Sensor Technology Crosscutting Program Technology Summary: Fiscal Year 2000*.
- Participate in EPA/DOE Meeting on Emerging Regulations Impacting Mixed Waste Treatment.
- Participate in DOE/Office of Environmental Management (EM) Communications Workshop.
- Participate in review of Request for Proposal (RFP) responses for Beryllium Monitor development.

TTP #: FT50504

TECHNICAL SUPPORT TO CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY-CROSSCUTTING PROGRAM

Principal Investigator: Paul Wang, Concurrent Technologies Corporation, 412-577-2648

Project Objectives:

The objective of this effort is to work with the Characterization, Monitoring, and Sensor Technology-Crosscutting Program (CMST-CP) managers and field support teams to help implement the CMST-CP multi-year program and to provide a technical lead to address the needs related to groundwater and soil problems.

Major Milestones:

<i>No.</i>	<i>Milestone Title</i>	<i>Due Date</i>	<i>Completion Date</i>
1	Assist in Technology Gap Analysis and Documentation of Response to Site Technology Coordination Group (STCG) Needs	04/30/00	03/31/00

Accomplishments and Technical Progress:

- Paul Wang of Concurrent Technologies Corporation (CTC) served on the 16-member Technical Assistance Team assigned to visit the Pantex Plant in April to investigate options for protecting the Ogallala Aquifer. He then contributed to the team document entitled “Recommendations for Protecting the Ogallala Aquifer at the Pantex Plant” and reviewed the pre-decisional draft document as requested. The Pantex technical interim report was released by the U.S. Department of Energy (DOE) secretary and posted for comments on the DOE website (www.doe.gov) under the “Headlines” section. Mr. Wang also participated in the follow-up Technical Assistance Team visit to Pantex and provided a write-up on the site monitoring strategy for RDX contamination in aquifers.
- As requested by the Subsurface Contaminants Focus Area (SCFA), completed and delivered a draft solicitation topic area entitled “In Situ Sensing to Support Long-Term Monitoring of Remediation Measures” for inclusion in the DOE/Office of Environmental Management (EM) Applied Research Call addressing subsurface contamination.
- As requested by the SCFA, contributed to the development of draft Program Execution Guidance (PEG) presentation by identifying the FY 2001 performance metrics for CMST-CP technologies in support of the SCFA, problem specifics, and planned accomplishments. In addition, contributed to the development of the short Technical Task Plans (TTPs) for three CMST-CP technologies in support of the SCFA: 1) Alternative Landfill Cover Demonstration, AL2-8-C2-21; 2) JCCM Contaminant Transport Modeling, RL3-5-C2-23; and 3) Innovative Dense Non-Aqueous Phase Liquids (DNAPL) Characterization Technologies, SR1-7-C2-21.

- As requested by Carl Lanigan of SCFA, provided Kim Abbott, Technical Program Officer (TPO) at the Oakland Operations Office, with the requested information on Technology Management System (TMS) #2157, Portable Hi-Purity Germanium Detectors for Delineating Contamination in Soils. This request was made as part of the site feedback to SCFA response to site needs.
- Continued to plan the effort of an independent assessment of the passive magnetic resonance technique to image subsurface contamination, also known as the Geocolog. This imaging technology is being demonstrated at Oak Ridge and is scheduled for demonstration next month at Fernald and Ashtabula. A panel meeting is planned for July 18 and 19, 2000, at Fernald. The panel effort was requested by Lawnie Taylor of DOE Headquarters (HQ).
- As requested by John Jones, CMST-CP Field Technical Manager, reviewed the *Draft Handbook of Groundwater Policies for Resource Conservation Recovery Act (RCRA) Corrective Action* and provided editorial comments and an alternative design for the “Overview” section. In addition, as requested, reviewed the white paper entitled *Evaluation of Using a Laser Drilling Approach Combined with Cone Penetrometer Test (CPT) for Enhanced Penetration of Difficult Hanford Geologies* by Wes Bratton, Applied Research Associates, and Lorne Everett, University of California–Santa Barbara. As requested by Ron Staubly of National Energy Technology Laboratory (NETL), conducted a Phase I review of base contract work performed by Sentor in regard to zenon detector technology.
- Continued to assist in redesigning the CMST-CP public website. This quarter, posted the CMST-CP Website Design Plan and the redesigned front page of the website on the CMST-CP team website for review by team members. Also, began work on completing the second-tier level in time for review at the CMST-CP Road Mapping Meeting on July 10, 2000.
- As requested by John Jones, Paul Wang attended the Environmental Management Science Program (EMSP) National Workshop and gave a presentation entitled “Characterization, Monitoring, and Sensor Technology (CMST) Development in Support of Long-Term Stewardship” during the Long-Term Stewardship breakout session. The presentation included information about the CMST-CP scope, near-term CMST-CP needs, DOE applications targeted by near-term CMST-CP development, benefits from long-term monitoring and verification technology, solutions sought by CMST-CP development to address the near-term scope, and CMST-CP technology development roadmap for long-term stewardship.
- Tiffany Zachry of CTC submitted the final version of a paper entitled “Publications Management from an Ecological Perspective: Three Documentation Case Studies” for presentation and proceedings publication at the International Professional Communication Conference/Special Interest Group in Documentation (IPCC/SIGDOC) 2000 Conference to be held during September in Boston. The conference is jointly sponsored by the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM). The paper includes case studies of two CMST-CP publication projects.
- As requested by CMST-CP field management, provided input for the second quarter business review, including comments on five technical task plans.
- Monthly reports regarding work performed for this task in March, April, and May 2000 and

a six-month self-assessment report were prepared and submitted as requested to the NDCEE and NETL.

Plans for the Next Quarter:

- Activities in support of the SCFA will be coordinated and level-of-support work requested by the CMST-CP management team will be provided.